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DANGEROUS CONDENSED MILK.

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During the course of the past summer attention was called to the sale of cans of condensed milk, with spoiled and possibly dangerous contents, and some sensational articles were published in the newspapers. I was subsequently requested by the local and State Boards of Health to investigate the matter, specimen cans of each brand at that time in the market being collected by inspectors and submitted to me for examination. A much more satisfactory inquiry could have been made had the inspectors ransacked the retail grocery stores and collected cans showing age or distention; but all the specimens which came to me were outwardly in good condition. I had no means of ascertaining their age.

The contents of the cans in most cases had the ordinary smell of condensed milk, and were neutral or nearly so to test-paper; others were faintly acid, and one strongly so. The last had thickened into a mass with the smell, taste, and consistency of some variety of soft cheese.

I give below a table, with description of each brand, and in another table the composition. In order to find the number of times the original milk has been condensed I have divided the percentage of milk solids (*i. e.*, the total solids less the added cane-sugar) by 12.5. This is done on the assumption that the average amount of solids in ordinary whole milk is represented by this figure. The quotient divided into the percentage of fat in the condensed milk gives the percentage of fat in the original milk before condensation.

Table I.—Milk Condensed with Cane-sugar.

Brand.	Color-tint.	Taste.	Odor.	Reaction.
Tip Top,	Reddish-brown.	Very sweet.	Normal.	Very slightly acid.
Eagle,	Yellowish-brown.	Sweet and pleasant.	Normal.	Nearly neutral.
Champion,	Yellowish-brown.	Sweet and dry.	Normal.	Nearly neutral.
Daisy,	Brownish-white.	Sweet and dry.	Normal.	Nearly neutral.
Full Weight,	Yellowish-brown.	Sweet.	Normal.	Neutral.
Sweet Clover,	Light yellowish-brown.	Sweet.	Normal.	Nearly neutral.
Challenge,	Dark yellowish-brown.	Sweet.	Normal.	Neutral.
Magnolia,	Nearly white.	Cheesy.	Cheesy.	Acid.
C. and S.	Yellowish-brown.	Sweet.	Normal.	Neutral.
Atlas,	Yellowish-brown.	Sweet and pleasant.	Like whole milk.	Slightly acid.
Leader,	Light brownish-white.	Sweet.	Normal.	Slightly acid.
Standard,	Brownish-white.	Sweet.	Normal.	Nearly neutral.
Winner,	Reddish-brown.	Buttery.	Faint cheesy.	Nearly neutral.
Bell,	Yellowish-brown.	Sweet and pleasant.	Normal.	Nearly neutral.
Red Cross,	Brownish-white.	Sweet, unpleasant.	Unpleasant.	Slightly acid.

I have taken the number 12.5 as representing the average total solids, because the State of New Jersey makes the legal standard 12 per cent., while other States enact 13. The last number represents very nearly the true average, but at the same time so much of the milk of particular cows, or particular breeds of cows, falls below this figure that I think the legal standard should properly be made 12.5 per cent.

In the process of condensation the tint of color natural to milk is, of course, somewhat intensified; but, in addition, some of the samples have quite a decided brownish tinge. This is due to a change in the fat. After extraction with ether the fat obtained in the process of analysis from condensed milk frequently has a tint of brownish-yellow, while the fat similarly obtained from ordinary milk is colorless or faint yellow. This change is of a character unfavorable to the use of such condensed milk in infant-feeding.

TABLE II.—MILK CONDENSED WITH CANE-SUGAR.

Brand.	Percentages.								Times condensed.
	Water.	Fat.	Caseine and albumin.	Milk-sugar.	Ash.	Cane-sugar.	Milk solids.	Fat in original milk.	
Tip Top	26.00	10.17	9.22	11.37	1.99	41.25	32.75	3.88	2.62
Eagle	28.32	9.11	9.06	10.11	1.91	41.49	30.19	3.78	2.41
Champion	27.72	9.60	9.52	10.11	1.83	41.22	31.06	3.87	2.48
Daisy	25.53	9.41	8.71	13.43	1.83	41.09	33.38	3.52	2.67
Full Weight	28.18	9.00	7.87	11.70	1.88	41.37	30.45	3.70	2.43
Sweet Clover	28.70	10.30	8.47	11.31	1.83	39.39	31.91	4.17	2.47
Challenge	28.44	9.86	8.99	10.05	1.82	40.84	30.72	4.04	2.45
Magnolia	30.04	9.48	8.17	12.81	1.91	37.59	32.37	3.66	2.59
C. and S.	26.99	9.11	8.68	16.98	2.15	36.09	36.92	3.09	2.95
Atlas	28.30	7.64	10.91	10.79	1.83	40.53	31.17	3.06	2.49
Leader	28.20	8.02	8.01	11.32	1.80	42.65	29.15	3.44	2.33
Standard	27.21	7.79	8.21	13.30	1.85	41.64	31.15	3.12	2.49
Winner	29.84	9.63	9.82	11.17	1.98	37.56	32.60	3.70	2.60
Bell	25.54	12.13	8.87	10.51	2.05	40.90	33.56	4.52	2.68
Red Cross	29.34	8.80	7.81	10.00	1.76	42.29	28.37	3.87	2.27
Average	27.89	8.67	8.82	11.66	1.83	40.39	31.71	3.69	2.52

On an average, 55 per cent. of the solid matters is cane-sugar. This, of course, imparts excessive sweetness, which renders infants fond of such milk and impatient when a change to an unsweetened diet is attempted. There is, in addition, a certain dry or even gritty taste in some samples. This is due to the milk-sugar, which being sparingly soluble, requiring from five to six parts of cold water to dissolve it, begins to crystallize out. It forms minute, hard, white, transparent crystals. This grittiness sometimes originates a prejudice, being attributed to some impurity, and to overcome this false notion some of the labels call attention to the gritty taste, and state that inasmuch as it is due to the presence of milk-sugar it is positive proof of the purity of

the fresh milk used in manufacture. Of course, this is an overstatement, since the milk might be impure and yet all of its milk-sugar might be present.

The most important change is that which sometimes results in producing condensed milk of a slimy, cheesy, or semi-solid character. Such milk, in the course of time, may even become quite solid, or "go hard," to employ the term familiarly used in the trade; or it may undergo putrefaction, liberating gases which distend or burst the can.

These changes are due to specific bacterial ferments getting into the milk before the process of condensation. What most concerns us here are not the description and characters of these organisms, but the circumstances under which they get into the milk and the effect they produce. Of those, for instance, which produce the slimy fermentation at least six species are known. They are not found in pure milk, and are not met with when the feed and fodder of the cattle, the barn and dairy, the milk-pails, utensils of every sort, and the toilet both of the cows and men are truly clean. The same remark applies to the entrance of all other fermentative and putrefactive bacteria.

Some cannot be avoided, but their multiplication can be minimized by careful handling of the milk prior to condensation, and particularly by its immediate cooling to a temperature as near 32° as practicable. Inspectors now forbid the marketing of milk for domestic use without such cooling immediately after milking, but the equal importance of so doing before condensation is not yet generally recognized. In the interim before cooling ptomaines in the nature of tyrotoxicon are generated, and act as more or less acute poisons.

Fortunately the interests of the public coincide with those of the manufacturers in most respects, and, apart from the propriety of its use for infant-nutrition, much can be said in praise of the great value of condensed mild as a manufactured product. It would be a great loss to the canner were he to use or purchase watered milk, since the chief expense is the evaporation of the water. And dairymen dishonest enough to water milk are also those most likely to have impure wells, improper food, and unclean surroundings. Not from added water, but only, in the case of condensed milk, from water used in washing utensils and in handling is danger to be dreaded. The evidence of the analysis shows that it is the usual practice to use unskimmed milk. It would be against the interests of the manufacturer to use impure or colored sugar, since these impurities in an article which forms the chief constituent of the food, and which can be bought in a pure condition at a low price, would produce a dark-colored, unsalable product.

And the same remark is true of the original milk itself. It is out of the question for the canner to employ a bacteriologist to examine the milk used, and the hardening and putrefactive changes which the con-

densed milk sometimes undergoes are usually due to failures in cleanliness, etc., at the dairy. Later on, the canner will participate with the public in the great benefits of a rigid system of inspection that will, first of all, begin with the dairy and the cattle themselves.

As things are at present, the manufacturer frequently has hundreds of cans which spoil in time on the shelves of the grocers from the causes mentioned. A small amount of contaminated milk contaminates all the rest used with it, and the results are not manifest until the goods are in the hands of the dealers. The canner is compelled to take them back very frequently, and often is most anxious to do so. Much of the residue is rejected by consumers as manifestly unfit for use, and so the dangerous and poisonous part is very small as compared with the total enormous output.

In this article I have avoided saying anything in relation to the effects on the health of children resulting from the use of milk containing more than half its weight in solid matter of cane-sugar—a foreign fermentescible substance. Nor in relation to the impossibility of preparing from such an article a modified milk, or humanized milk, which is comparable to woman's milk, or even feebly approaches it, in nutritive value.

These latter objections do not apply to the milk condensed without the addition of cane-sugar. But even more care should be used to see that the milk thus condensed is kept free from the products of bacterial action in the interval between milking and canning. And inasmuch as cane-sugar acts as a preservative, milk condensed without it is more susceptible to change and more apt to act upon the metal of the can than when cane-sugar is present. For these reasons it would be better were it preserved in glass bottles rather than in tin cans.